FIS920030135US1
(126.0027)

## REMARKS

Claims 1-23 were pending in the present amendment. Claims 1, 15, and 23 have been amended, and Claim 16 has been canceled, leaving Claims 1-15 and 17-23 for consideration in the present amendment. In the amended claims, the transitional language has been changed, support for which can be found at least in the Examples. It is believed the amendments made herein may be properly entered at this time, i.e., after final rejection, because the amendments do not require a new search or raise new issues and they reduce issues for appeal. No new matter has been entered by way of amendment.

Reconsideration and allowance of the claims is respectfully requested in view of the amendments and the following remarks.

Claim Rejection Under 35 U.S.C. §102(b)

Claims 1 and 8-14 stands rejected under 35 USC §102(b) as being anticipated by US Patent No. 5,930,655 to Cooney, III et al. (hereinafter "Cooney"). Applicants respectfully traverse.

To anticipate a claim under 35 U.S.C. § 102, a single source must contain all of the elements of the claim. *Lewmar Marine Inc. v. Barient, Inc.*, 827 F.2d 744, 747, 3 U.S.P.Q.2d 1766, 1768 (Fed. Cir. 1987), *cert. denied*, 484 U.S. 1007 (1988).

Cooney fails to anticipate Claims 1 and 8-14 because Cooney fails to disclose a process that *consists essentially of* generating atomic hydrogen species; and exposing the fluorine-containing dielectric to the atomic hydrogen species in an amount effective to lower the fluorine content in the fluorine-containing dielectric. Rather Cooney employs a thermal annealing process in hydrogen that can be done in combination with plasma. As such, Cooney does not discloses a process that consists essentially of generating atomic hydrogen species; and exposing the fluorine-containing dielectric to the atomic hydrogen species in an amount effective to lower the fluorine content in the fluorine-containing dielectric.

Accordingly, Cooney fails to disclose each and every claimed element and the rejection applied to Claim 1 should be withdrawn. Since Claims 8-14 variably depend from Claim 1 and include the feature of exposing the fluorine-containing dielectric to the atomic hydrogen species, these claims are not anticipated by Cooney for at least the same reasons.

Claim Rejection under 35 USC §102(e)

Claim 23 stands rejected as being anticipated by US Patent No. 6,433,432 to Shimzu. Applicant respectfully traverses.

Shimzu is generally directed to a process for integrating a fluorinated insulating layer into the manufacture of an integrated circuit. The process generally includes argon sputtering the surface of the copper wiring and then exposing the copper wiring to ammonia ($NH_3$) plasma or by treating the copper wiring to a CMP process using slurry A (see Col. 8, ll. 42-53). In this manner, the problems caused by the fluorine containing films can be avoided, e.g., peeling or delamination of the copper wiring.

Independent Claim 23 is directed to a process for lowering fluorine content after metal fill and planarization of a metal conductor and fluorine-containing dielectric wire structure consisting essentially of, *inter alia*, generating atomic nitrogen species from nitrogen gas or a mixture containing the nitrogen gas.

As discussed above, to anticipate a claim under 35 U.S.C. § 102, a single source must contain all of the elements of the claim.

Shimzu fails to anticipate Claim 23 because the cited reference fails to disclose a process consisting essentially of, *inter alia*, generating atomic nitrogen species from nitrogen gas or a mixture containing the nitrogen gas. Rather, Shimzu discloses an argon sputtering process followed by exposure to the ammonia plasma.

Accordingly, Shimzu fails to anticipate Claim 23 and the rejection is requested to be withdrawn.

First Claim Rejection Under 35 U.S.C. §103(a)

Claims 2-7 stand rejected under 35 U.S.C. §103(a), as allegedly unpatentable over Cooncy. Applicants respectfully traverse.

Cooncy is discussed above.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a prima facie case of obviousness. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). Establishing a prima facie case of obviousness requires that all elements of the invention be disclosed in the prior art. *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970).

A prima facie case has not been established because Cooney fails to teach or suggest, a process that consists essentially of generating atomic hydrogen species; and exposing the fluorine-containing dielectric to the atomic hydrogen species in an amount effective to lower the fluorine content in the fluorine-containing dielectric. As previously discussed, Cooncy generally teaches and suggests an annealing process in combination with a plasma process. As such, Cooncy fails to establish a prima facie case against Claims 2-7.

Accordingly, the rejection is requested to be withdrawn.

Second Claim Rejection Under 35 U.S.C. §103(a)

Claims 15-22 stand rejected under 35 U.S.C. §103(a), as allegedly unpatentable over Shimzu in view of US Patent Application Publication No. 2002/0063312A1 to Towle et al. (Towle). Applicants respectfully traverse.

Shimzu is discussed above.

Towle is generally directed to integration of fluorinated low k dielectrics into a semiconductor manufacturing process. The process generally includes providing fluorinated low k dielectric materials having near surface portions that have fluorine concentrations that are lower fluorine concentrations found in the interior portions of the low k dielectric materials. The fluorinated low k dielectric materials are exposed to reducing plasma.

Applicants Claim 15 is directed to a process for forming a wiring structure including a copper metal conductor and a fluorine-containing dielectric, consisting essentially of forming a gap in a layer of the fluorine-containing dielectric; overfilling the gap with the copper metal conductor; planarizing and removing the copper metal conductor above the fluorine-containing dielectric to expose a surface of the fluorine-containing dielectric; forming a plasma from a hydrogen bearing gas to generate atomic hydrogen species, wherein the hydrogen bearing gas comprises a hydrocarbon, ammonia, a hydrofluorocarbon, a hydrogen gas, a water vapor, or mixtures comprising at least one of the foregoing hydrogen bearing compounds; exposing the surface of the fluorine-containing dielectric to the atomic hydrogen species; and removing fluorine from and about the surface of the fluorine-containing dielectric.

Shimzu in combination with Towle fails to teach or suggest Applicants claimed process. As previously discussed, Shimzu teaches and suggests an argon sputtering process followed by exposure to ammonia plasma.

Although Towle suggests exposing fluorine-containing dielectrics to reducing plasmas, Towle also discloses and suggests the use of a barrier layer as noted below. As noted in Applicants background section, one problem that occurs during the integration of fluorine-containing dielectrics is that fluorine can react with copper metal conductors in presence of water and cause the copper metal conductor to redeposit and form dendrite- or nodule-like structures. Current methods to overcome this phenomenon generally require a capping or liner material. Towle is one such reference that teaches the use of a barrier layer (see Towle, paragraph [0031]). Applicants have developed a process that does not include depositing a barrier layer. Moreover, Towle does not disclose overfilling gaps with a copper conductor. Rather, Towle teaches and suggests forming the dielectric with reduced fluorine content prior to metallization. Thus, it appears the Office Action is improperly relying on hindsight by picking and choosing various elements from the cited references.

The Examiner is reminded that a finding of "obvious to try" does not provide the proper showing for an obviousness determination. The requirement for a determination of obviousness is that "both the suggestion and the expectation of success must be founded in

the prior art, not in applicant's disclosure" (emphasis added). *In re Dow Chem.*, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988). An Examiner, then, cannot base a determination of obviousness on what the skilled person in the art might try or find obvious to try. Rather, the proper test requires determining what the prior art would have led the skilled person to do. The present combination of references would not have lead one skilled in the art to a process for forming a wiring structure including a copper metal conductor and a fluorine-containing dielectric consisting essentially of forming a gap in a layer of the fluorine-containing dielectric; overfilling the gap with the copper metal conductor; planarizing and removing the copper metal conductor above the fluorine-containing dielectric to expose a surface of the fluorine-containing dielectric; forming a plasma from a hydrogen bearing gas to generate atomic hydrogen species, wherein the hydrogen bearing gas comprises a hydrocarbon, ammonia, a hydrofluorocarbon, a hydrogen gas, a water vapor, or mixtures comprising at least one of the foregoing hydrogen bearing compounds; exposing the surface of the fluorine-containing dielectric to the atomic hydrogen species; and removing fluorine from and about the surface of the fluorine-containing dielectric.

In view of the foregoing the rejection of Claims 15-22 is requested to be withdrawn.

It is believed that the foregoing remarks fully comply with the Final Office Action and place the application in condition for immediate allowance, which action is earnestly solicited.

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If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 09-0458 maintained by Applicants' Attorneys.

Respectfully submitted,

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